

What is claimed is:

1. An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the device comprising:

motion compensation vector acquisition unit operable to acquire a motion compensation vector of a coded block that forms the coded image signal by decoding the coded image signal; and

interpolation frame generation unit operable to generate the interpolation frame in accordance with at least a motion vector of an image block that forms an image frame by using the motion compensation vector of the coded block as the motion vector of the image block.

2. An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the device comprising:

motion compensation vector acquisition unit operable to acquire motion compensation vectors of coded blocks that form the coded image signal by decoding the coded image signal;

motion vector detection unit operable to detect at least a motion vector between a base frame and a reference frame, the unit detecting the motion vector of an image block forming the base frame in a certain area of the reference frame that is determined in accordance with the

motion compensation vectors; and

interpolation frame generation unit operable to generate the interpolation frame in accordance with the detected motion vector.

5           3. An interpolation frame generation device for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation, the device comprising:

10           image signal information acquisition unit operable to acquire image signal information of the coded image signal;

            motion vector detection unit operable to partially select at least an image block among the entire image  
15 blocks that form a base frame and to detect a motion vector of the partially selected image block between the base frame and a reference frame; and

            interpolation frame generation unit operable to generate the interpolation frame in accordance with the  
20 image signal information and the motion vector.

            4. The interpolation frame generation device according to claim 3, wherein

            the image signal information includes a motion compensation vector or a coding mode of a coded block that  
25 form the coded image signal, and

            the partially selected image block is an image block that is determined to be stationary from the image signal information or an image block that is decided to have a movement having low correlation with the adjacent image  
30 blocks from the image signal information.

5. The interpolation frame generation device according to claim 3 or 4, wherein

the image signal information includes a coding mode of a coded block that forms the coded image signal, and

5 the partially selected image block is an intra block.

6. An interpolation frame generation device for generating an interpolation frame for interpolating image frames, the device comprising:

10 movement associated information acquisition unit operable to acquire movement associated information about movements of image blocks that form an image frame;

interpolation vector derivation unit operable to derive a global motion vector for generating an interpolation frame in accordance with the movement  
15 associated information; and

interpolation frame generation unit operable to generate the interpolation frame in accordance with the global motion vector.

7. The interpolation frame generation device according to claim 6, wherein

20 the global motion vector is derived from movement associated information of image blocks partially selected from all of image blocks.

8. The interpolation frame generation device according to claim 6, wherein

25 the movement associated information is motion compensation vectors of coded blocks that form a coded image signal for decoding the image frames; and

30 the interpolation frame generation unit generates the interpolation frame by utilizing the global motion

vector derived for an image frame that is located either before or after an intra coded image frame in the display order.

9. An interpolation frame generation device for  
5 generating an interpolation frame for interpolating image frames, the device comprising:

movement associated information acquisition unit operable to acquire movement associated information about movements of image blocks that form an image frame;

10 image frame decision unit operable to decide whether or not the image frame is adequate for generating the interpolation frame; and

interpolation frame generation unit operable to generate the interpolation frame in accordance with the  
15 movement associated information by switching methods of generating the interpolation frame in accordance with the decision.

10. The interpolation frame generation device according to claim 9, wherein

20 the interpolation frame generation unit can use at least a portion of image frames located before and/or after the interpolation frame in the display order as the interpolation frame when the decision is negative.

11. The interpolation frame generation device  
25 according to claim 9, further comprising

interpolation vector derivation unit operable to derive a global motion vector for generating an interpolation frame in accordance with the movement associated information, wherein

30 the interpolation frame generation unit can generate

the interpolation frame in accordance with the global motion vector when the decision is negative.

12. The interpolation frame generation device according to claim 9, wherein

5       the interpolation frame generation unit does not generate the interpolation frame when the decision is negative.

13. An interpolation frame generation device for generating an interpolation frame for interpolating image  
10 frames, the device comprising:

generation process ability decision unit operable to decide generation process ability for generating the interpolation frame; and

interpolation frame generation unit operable to  
15 generate the interpolation frame in accordance with a decision of the generation process ability decision unit.

14. The interpolation frame generation device according to claim 13, wherein

the interpolation frame generation unit changes the  
20 number of interpolation frames in accordance with a decision of the generation process ability decision unit.

15. The interpolation frame generation device according to claim 13 or 14, wherein

the interpolation frame generation unit changes the  
25 number of image blocks that form an image frame in which the motion vectors are detected in accordance with a decision of the generation process ability decision unit.

16. The interpolation frame generation device according to claim 13, 14 or 15, wherein

30       the interpolation frame generation unit changes a

range in which a motion vector of image block that forms an image frame is detected in accordance with a decision of the generation process ability decision unit.

17. The interpolation frame generation device  
5 according to any one of claims 13-16, wherein  
the generation process ability decision unit decides an attribution of an image signal made of the image frame.

18. An interpolation frame generation device for  
generating an interpolation frame for interpolating image  
10 frames, the device comprising:

motion vector detection unit operable to detect at least a motion vector of an image block that forms an image frame via a motion detecting unit of a coding device for motion compensation coding; and

15 interpolation frame generation unit operable to generate the interpolation frame in accordance with the motion vector.

19. The interpolation frame generation device  
according to claim 18, further comprising

20 operating state decision unit operable to decide an operating state of the motion detecting unit of the coding device; wherein

the interpolation frame generation unit generates the interpolation frame in accordance with the decided  
25 operating state.

20. The interpolation frame generation device  
according to claim 19, wherein

the interpolation frame generation unit does not generate the interpolation frame when the operating state  
30 decision unit decides that the motion detecting unit of

the coding device is operating.

21. The interpolation frame generation device  
according to claim 19 or 20, wherein

the interpolation frame generation unit generates  
5 the interpolation frame in accordance with motion  
compensation vectors of coded blocks that are obtained by  
decoding the image frames when the operating state  
decision unit decides that the motion detecting unit of  
the coding device is operating.

10 22. An interpolation frame generation device for  
generating an interpolation frame for interpolating image  
frames, the device comprising:

motion vector detection unit operable to detect  
motion vectors by utilizing a plurality of first image  
15 frames that are located either before or after the  
interpolation frame in the display order; and

interpolation frame generation unit operable to  
generate the interpolation frame in accordance with the  
motion vectors.

20 23. The interpolation frame generation device  
according to claim 22, wherein

the plurality of first image frames are located on  
one side of the interpolation frame in the display order  
and include a plurality of base frames that serve as bases  
25 for detecting the motion vectors;

one or a plurality of second image frames are  
located on another side of the interpolation frame in the  
display order and include a reference frame that serves as  
an object for detecting the motion vectors; and

30 the motion vector detection unit detects the motion

vectors between the base frames and the reference frame.

24. The interpolation frame generation device according to claim 22, wherein

the plurality of first image frames are located on  
5 one side of the interpolation frame in the display order  
and include a plurality of reference frames that serve as  
references for detecting the motion vectors;

one or a plurality of second image frames are  
located on another side of the interpolation frame in the  
10 display order and include a base frame that serves as a  
base for detecting the motion vectors; and

the motion vector detection unit detects the motion  
vectors between the base frame and the reference frames.

25. The interpolation frame generation device  
15 according to claim 22, wherein

the plurality of first image frames includes a base  
frame that serves as a base for detecting the motion  
vectors and a reference frame that serves as an object for  
detecting the motion vectors; and

20 the motion vector detection unit detects the motion  
vectors between the base frame and the reference frame.

26. The interpolation frame generation device  
according to claim 22, wherein

the motion vector detection unit detects a first  
25 motion vector between a first base frame that serves as a  
base for detecting the first motion vector and a first  
reference frame that is located before the first base  
frame in the display order, and detects a second motion  
vector between a second base frame that serves as a base  
30 for detecting the second motion vector and a second



reference frame that is located after the second base frame in the display order, and

the interpolation frame generation unit can generate the interpolation frame in accordance with the first  
5 motion vector and the second motion vector.

27. The interpolation frame generation device according to claim 22, wherein

the motion vectors include a motion vector for generating an interpolation block that forms the  
10 interpolation frame, and is detected from a base pixel area that forms a base frame that serves as a base for detecting the motion vector and a reference pixel area that forms a reference frame that serves as an object for detecting the motion vector, and

15 the position of the reference pixel area in the reference frame is defined as a position indicated by a vector that is obtained by internal division or external division of the vector that is connected between the position of the base pixel area in the base frame and the  
20 position of the interpolation block in the interpolation frame.

28. An interpolation frame generation device for generating an interpolation frame for interpolating image frames, the device comprising:

25 area determination unit operable to determine an interpolation inadequate area that is not adequate for generating the interpolation frame in an outer frame area of an image frame; and

interpolation frame generation unit operable to  
30 generate the interpolation frame in accordance with

movement associated information about movements of image blocks that form the image frame and to perform a special area compensation process for the decided interpolation inadequate area so as to generate the interpolation frame.

5           29. The interpolation frame generation device according to claim 28, wherein

the interpolation inadequate area is an area having substantially a constant pixel value in the outer frame area.

10           30. The interpolation frame generation device according to claim 28, wherein

the interpolation inadequate area is a predetermined area for an image size of the image frame.

15           31. The interpolation frame generation device according to claim 28, wherein

the area determination unit determines the interpolation inadequate area in accordance with obtained interpolation inadequate area information that indicates the interpolation inadequate area.

20           32. The interpolation frame generation device according to claim 31, wherein

the interpolation inadequate area information includes a display size of a display device for displaying an image signal made of a plurality of the image frames  
25 and a memory size of a memory for a display of the display device.

33. An interpolation frame generation method for generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal  
30 that is coded by motion compensation, the method

comprising:

an image signal information acquisition step for acquiring image signal information of the coded image signal;

5 a motion vector detection step for partially selecting at least an image block among the entire image blocks that form a base frame and for detecting a motion vector of the partially selected image block between the base frame and a reference frame; and

10 an interpolation frame generation step for generating the interpolation frame in accordance with the image signal information and the motion vector.

34. An interpolation frame generation method for generating an interpolation frame for interpolating image frames, the method comprising:

15 a movement associated information acquisition step for acquiring movement associated information about movements of image blocks that form an image frame;

an interpolation vector derivation step for deriving  
20 a global motion vector for generating an interpolation frame in accordance with the movement associated information; and

an interpolation frame generation step for generating the interpolation frame in accordance with the  
25 global motion vector.

35. An interpolation frame generation method for generating an interpolation frame for interpolating image frames, the method comprising:

a movement associated information acquisition step  
30 for acquiring movement associated information about

movements of image blocks that form an image frame;

an image frame decision step for deciding whether or not the image frame is adequate for generating the interpolation frame; and

5 an interpolation frame generation step for generating the interpolation frame in accordance with the movement associated information by switching a method of generating the interpolation frame in accordance with the decision.

10 36. An interpolation frame generation method for generating an interpolation frame for interpolating image frames, the method comprising:

the generation process ability decision step for deciding the generation process ability for generating the  
15 interpolation frame; and

an interpolation frame generation step for generating the interpolation frame in accordance with a decision in the generation process ability decision step.

20 37. An interpolation frame generation method for generating an interpolation frame for interpolating image frames, the method comprising:

a motion vector detection step for detecting at least a motion vector of an image block that forms an image frame via a motion detecting unit of a coding device  
25 for motion compensation coding; and

an interpolation frame generation step for generating the interpolation frame in accordance with the motion vector.

30 38. An interpolation frame generation method for generating an interpolation frame for interpolating image

frames, the method comprising:

a motion vector detection step for detecting motion vectors by utilizing a plurality of first image frames that are located either before or after the interpolation  
5 frame in the display order; and

an interpolation frame generation step for generating the interpolation frame in accordance with the motion vectors.

39. An interpolation frame generation method for  
10 generating an interpolation frame for interpolating image frames, the method comprising:

an area determination step for determining an interpolation inadequate area that is an outer frame area of an image frame and is not adequate for generating the  
15 interpolation frame; and

an interpolation frame generation step for generating the interpolation frame in accordance with movement associated information about movements of image blocks that form the image frame and for performing a  
20 special area compensation process for the decided interpolation inadequate area so as to generate the interpolation frame.

40. An interpolation frame generation program for performing an interpolation frame generation method for  
25 generating an interpolation frame for interpolating image frames that are obtained by decoding a coded image signal that is coded by motion compensation by using a computer,  
the interpolation frame generation program making the computer execute the interpolation frame generation  
30 method comprising:

an image signal information acquisition step for acquiring image signal information of the coded image signal;

5 a motion vector detection step for partially selecting at least an image block among the entire image blocks that form a base frame and for detecting a motion vector of the partially selected image block between the base frame and a reference frame; and

an interpolation frame generation step for  
10 generating the interpolation frame in accordance with the image signal information and the motion vector.

41. An interpolation frame generation program for performing an interpolation frame generation method for generating an interpolation frame for interpolating image  
15 frames by using a computer,

the interpolation frame generation program making the computer execute the interpolation frame generation method comprising:

a movement associated information acquisition step  
20 for acquiring movement associated information about movements of image blocks that form an image frame;

an interpolation vector derivation step for deriving a global motion vector for generating an interpolation frame in accordance with the movement associated  
25 information; and

an interpolation frame generation step for generating the interpolation frame in accordance with the global motion vector.

42. An interpolation frame generation program for  
30 performing an interpolation frame generation method for

generating an interpolation frame for interpolating image frames by using a computer,

the interpolation frame generation program making the computer execute the interpolation frame generation

5 method comprising:

a movement associated information acquisition step for acquiring movement associated information about movements of image blocks that form an image frame;

an image frame decision step for deciding whether or  
10 not the image frame is adequate for generating the interpolation frame; and

an interpolation frame generation step for generating the interpolation frame in accordance with the movement associated information by switching a method of  
15 generating the interpolation frame in accordance with the decision.

43. An interpolation frame generation program for performing an interpolation frame generation method for generating an interpolation frame for interpolating image  
20 frames by using a computer,

the interpolation frame generation program making the computer execute the interpolation frame generation method comprising:

generation process ability decision step for  
25 deciding generation process ability for generating the interpolation frame; and

an interpolation frame generation step for generating the interpolation frame in accordance with a decision in the generation process ability decision step.

30 44. An interpolation frame generation program for

performing an interpolation frame generation method for generating an interpolation frame for interpolating image frames by using a computer,

the interpolation frame generation program making  
5 the computer execute the interpolation frame generation method comprising:

a motion vector detection step for detecting at least a motion vector of an image block that forms an image frame via a motion detecting unit of a coding device  
10 for motion compensation coding; and

an interpolation frame generation step for generating the interpolation frame in accordance with the motion vector.

45. An interpolation frame generation program for  
15 performing an interpolation frame generation method for generating an interpolation frame for interpolating image frames by using a computer,

the interpolation frame generation program making the computer execute the interpolation frame generation  
20 method comprising:

a motion vector detection step for detecting motion vectors by utilizing a plurality of first image frames that are located either before or after the interpolation frame in the display order; and

25 an interpolation frame generation step for generating the interpolation frame in accordance with the motion vectors.

46. An interpolation frame generation program for  
performing an interpolation frame generation method for  
30 generating an interpolation frame for interpolating image



frames by using a computer,

the interpolation frame generation program making the computer execute the interpolation frame generation method comprising:

- 5           an area determination step for determining an interpolation inadequate area that is an outer frame area of an image frame and is not adequate for generating the interpolation frame; and
- an interpolation frame generation step for
- 10   generating the interpolation frame in accordance with movement associated information about movements of image blocks that form the image frame and for performing a special area compensation process for the decided interpolation inadequate area so as to generate the
- 15   interpolation frame.